

## CLAIMS

We claim:

1. A polymer electrolyte comprising:
  - 2 a modified polymeric material, said modified polymeric material including a
  - 3 halogen containing polymer having an enhanced halogen level, said enhanced halogen level relative to a halogen content of said halogen containing polymer formed from polymerization of its monomer;
  - 4 a salt of an alkali metal; and
  - 5 an aprotic solvent, wherein said salt and said aprotic solvent are integrated with
  - 6 said modified polymeric material.
- 7 2. The polymer electrolyte of claim 1, wherein said halogen containing polymer
- 8 includes at least one chlorine containing polymer.
- 1 3. The polymer electrolyte of claim 2, wherein said chlorine containing polymer is
- 2 polyvinylchloride (PVC).
- 1 4. The polymer electrolyte of claim 3, wherein said polyvinylchloride (PVC) is
- 2 suspension polyvinylchloride (PVC).

1        5.     The polymer electrolyte of claim 3, wherein said polyvinylchloride (PVC) is  
2     emulsion polyvinylchloride (PVC).

1        6.     The polymer electrolyte of claim 1, wherein said modified polymeric material  
2     comprises C-PVC, said C-PVC having 60-72 wt % chlorine.

1        7.     The polymer electrolyte of claim 6, wherein said polymer electrolyte comprises  
2     10-40 wt % of said C-PVC.

1        8.     The polymer electrolyte of claim 1, wherein said alkali metal salt is at least one  
2     selected from the group consisting of LiClO<sub>4</sub>, LiBF<sub>4</sub>, LiAsF<sub>6</sub>, LiPF<sub>6</sub>, LiCF<sub>3</sub>SO<sub>3</sub> and  
3     LiN(CF<sub>3</sub>SO<sub>2</sub>)<sub>2</sub>.

1        9.     The polymer electrolyte of claim 1, wherein said electrolyte comprises from 3-20  
2     wt % of said salt of an alkali metal.

1        10.    The polymer electrolyte of claim 1, wherein as said aprotic solvent is at least one  
2     selected from the group consisting of propylene carbonate, ethylene carbonate, dimethyl  
3     carbonate, gamma-butyrolactone, 1,3-dioxolane and dimethoxyethane.

1        11.    The polymer electrolyte of claim 1, wherein said electrolyte comprises 40-82 wt  
2     % of said aprotic solvent.

1        12. A rechargeable battery, comprising:  
2              an anode containing an alkali metal;  
3              a cathode; and  
4              a polymer electrolyte formed from a modified polymeric material, said modified  
5        polymeric material including a halogen containing polymer having an enhanced halogen level,  
6        said enhanced halogen level relative to a halogen content of said halogen containing polymer  
7        formed from polymerization of its monomer, a salt of an alkali metal and an aprotic solvent,  
8        wherein said salt and said aprotic solvent are integrated with said modified polymeric material.

1        13. The rechargeable battery of claim 12, wherein said halogen containing polymer  
2        comprises at least one chlorine containing polymer.

1        14. The rechargeable battery of claim 13, wherein said modified polymeric material  
2        comprises chlorinated polyvinylchloride (C-PVC).

1        15. The rechargeable battery of claim 12, wherein in said anode comprises lithium.

1        16. The rechargeable battery of claim 12, wherein said anode comprises a lithium  
2        alloy.

1        17. The rechargeable battery of claim 16, wherein as said lithium alloy is at least one  
2        selected from the group consisting of lithium-aluminum, lithium-aluminum-silicon, lithium-  
3        aluminum-cadmium, lithium-aluminum-bismuth and lithium-aluminum-tin.

1        18. The rechargeable battery of claim 12, wherein said anode comprises a lithium-ion  
2        material.

1        19. The rechargeable battery of claim 12, wherein said cathode comprises a metal  
2        oxide.

1        20. The rechargeable battery of claim 12, wherein said cathode comprises a lithium-  
2        transition metal oxide.

1        21. The rechargeable cell of claim 12, wherein said cathode is at least one selected  
2        from the group consisting of  $MnO_2$ ,  $LiMn_2O_4$  and vanadium oxides ( $V_xO_y$ ).

1        22. The rechargeable cell of claim 12, wherein said cathode comprises a organic  
2        polymer.

1        23. The rechargeable cell of claim 12, wherein said cathode is at least one selected  
2        from the group consisting of polyviologen, polyacetylene and polypyrrole.

1        24. The rechargeable cell of claim 12, wherein said cathode comprises a sulfur  
2        containing material.

1        25. The rechargeable cell of claim 12, wherein said cathode is at least one selected  
2        from the group consisting of TiS<sub>2</sub>, S, polysulphide and polythiophene.

1        26. A polymer comprising:  
2              a modified polymeric material, said modified polymeric material including a  
3        halogen containing polymer having an enhanced halogen level, said enhanced halogen level  
4        relative to a halogen content of said halogen containing polymer formed from polymerization of  
5        its monomer.

1        27. A method for preparing solid polymer electrolytes, comprising the steps of:  
2              providing a halogen containing polymer;  
3              halogenating said halogen containing polymer, wherein an enhanced halogen  
4        containing modified polymer material results, said enhanced halogen level relative to a halogen  
5        content of said halogen containing polymer formed from polymerization of its monomer;  
6              blending together said modified polymer material, at least one salt of an alkali  
7        metal and at least one aprotic solvent.

1        28. The method of claim 27, wherein said halogen containing polymer comprises at  
2        least one chlorine containing polymer.

1        29.     The method of claim 28, wherein said chlorine containing polymer comprises  
2 polyvinylchloride (PVC).

1        30.     The method of claim 29, wherein said polyvinylchloride (PVC) is suspension  
2 polyvinylchloride (PVC).

1        31.     The method of claim 29, wherein said polyvinylchloride (PVC) is emulsion  
2 polyvinylchloride (PVC).

1        32.     The method of claim 27, wherein said modified polymeric material comprises  
2 chlorinated polyvinylchloride (C-PVC).

1        33.     The method of claim 32, wherein said halogenation comprises chlorination, said  
2 PVC being chlorinated by a process of homogeneous or heterogeneous chlorination.

1        34.     The method of claim 27, wherein said blending step includes comprises addition  
2 of a volatile solvent.

1        35.     The method of claim 34, further comprising the step of removing said volatile  
2 solvent.

1        36. The method of claim 35, wherein said removing step comprises vacuum  
2 processing at room temperature.